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Non-constant volume exponential solutions in higher-dimensional Lovelock cosmologies

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Abstract

© 2015, Springer Science+Business Media New York. In this paper we propose a scheme which allows one to find all possible exponential solutions of special class—non-constant volume solutions—in Lovelock gravity in arbitrary number of dimensions and with arbitrate combinations of Lovelock terms. We apply this scheme to -dimensional flat anisotropic cosmologies in Einstein–Gauss–Bonnet and third-order Lovelock gravity to demonstrate how our scheme does work. In course of this demonstration we derive all possible solutions in dimensions and compare solutions and their abundance between cases with different Lovelock terms present. As a special but more “physical” case we consider spaces which allow three-dimensional isotropic subspace for they could be viewed as examples of compactification schemes. Our results suggest that the same solution with three-dimensional isotropic subspace is more “probable” to occur in the model with most possible Lovelock terms taken into account, which could be used as kind of anthropic argument for consideration of Lovelock and other higher-order gravity models in multidimensional cosmologies.

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Keywords

Exact solutions, Lovelock gravity, Modified gravity, Multidimensional cosmology